Legacy Systems Sustainment

Consolidated System Obsolescence Mitigation

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Outline

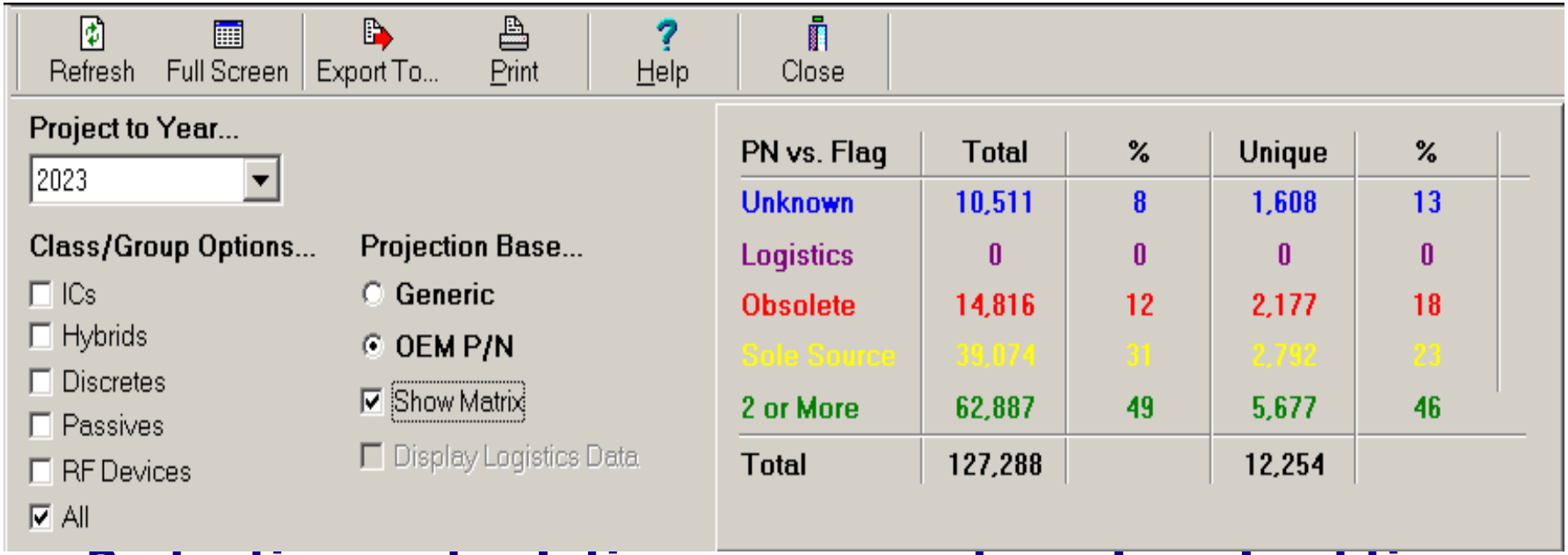
- **The Environment**
- **Guidance and Enabling Activities**
- **Define Platform Configurations**
- **Data Collection**
- **F-15 Sustainment Approach**
- **SUSTAIN**
  - **Force Structure Reduction (FSR) Prediction**
  - **Mission Degradation**
  - **Sustain FSR Analysis**
  - **Reliability Analysis**
  - **Sustainment Cost**
  - **Technology Insertion**
- **LFEA Partnerships**
- **Summary**

The Environment

- **It's a Readiness Issue:**
  - **AF transformation CONOPS require effects-based capabilities**
  - **Acquisition programs buy tomorrow's capability**
  - **What about today's?**
- **DMS & Parts Obsolescence:**
  - **Threaten availability of today's capabilities**
  - **Drive bills for premature acquisition of new systems and mods**
- **Brings a Solution to the Table for an Enterprise Problem**

The Environment

- **F-15 is an aging aircraft system – Obsolescence is a major threat to Mission Readiness**



PN vs. Flag	Total	%	Unique	%
Unknown	10,511	8	1,608	13
Logistics	0	0	0	0
Obsolete	14,816	12	2,177	18
Sole Source	39,074	31	2,792	23
2 or More	62,887	49	5,677	46
Total	127,288		12,254	

- **Budgeting and solution processes have long lead times**
- **The scope of the problem is too large for manual analysis**

= Need for automated, proactive management approach

The Environment

“The loss or impending loss of manufacturers of items or suppliers of items or raw materials may cause material shortages that endanger a weapon systems’ or equipment’s development, production, or post-production support capability. The DoD Components shall proactively take timely and effective actions to identity and minimize the DMSMS impact on DoD acquisition and logistics support efforts.”

DoD 4140.1-R, May 23, 2003

The Environment

AFI 63-1201

Assurance of Operational Safety, Suitability, and Effectiveness

"… ensure that activities such as operational use, configuration changes, maintenance repairs, and parts substitutions do not degrade system or end-item baselined characteristics over their operational life…"

Guidance and Enabling Activities

- **Functional Obsolescence**
  - **Upgrade system capability to counter an evolving threat**
  - **User driven system upgrade**
- **Hardware Obsolescence**
  - **Maintain existing capability**
  - **Sustainer driven, component or board solutions**
  - **DMSMS resolution**
  - **Replace low reliability or high cost-of-ownership components or assemblies**

Guidance and Enabling Activities

- **Maximize support to the Warfighter**
- **No degradation to operational performance or reliability (OSS&E)**
- **DMSMS**
- **Maximize reliability and maintainability**
- **Minimize cost of ownership**
- **Evaluation of ALL relevant information**
- **Evaluation of component vs. higher assembly technology refreshment alternatives**

Guidance and Enabling Activities

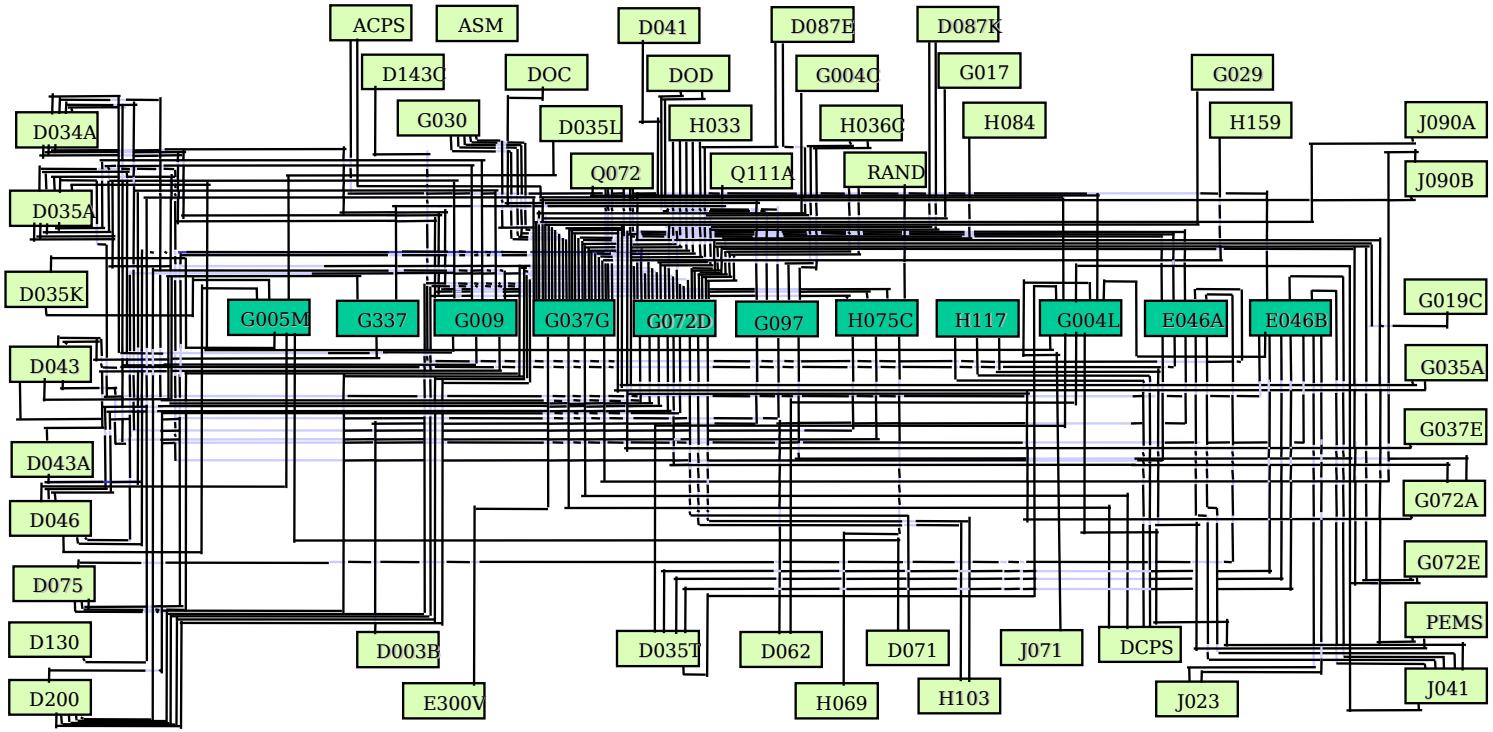
- **4 steps to success:**
  - **Define platform configuration**
  - **Establish data collection capability with priority**
  - **Develop analysis tools and business case process**
  - **Create industry partnerships for long-term supportability**

Define Platform Configurations

- **It is imperative to define Weapon System configuration indentured from the platform to consumable bit/piece part.**
- **The USAF uses the Work Unit Code, WUC, to manage the platform configuration, which allows direct comparison of information across disparate systems.**
  - **Defines configuration from Platform to Lowest Level of Repair**
  - **All maintenance data is archived and retrieved via the WUC**
- **All cost and inventory data is managed via NSN**
  - **Therefore, a WUC to NSN cross reference is vital to correlate data for technology refreshment candidates.**

Data Collection

- **There is a plethora of existing, official databases from which to gather data, and choosing the right subset to use is critical for making optimum sustainment decisions. LFEA uses information from eight sources.**



Data Collection

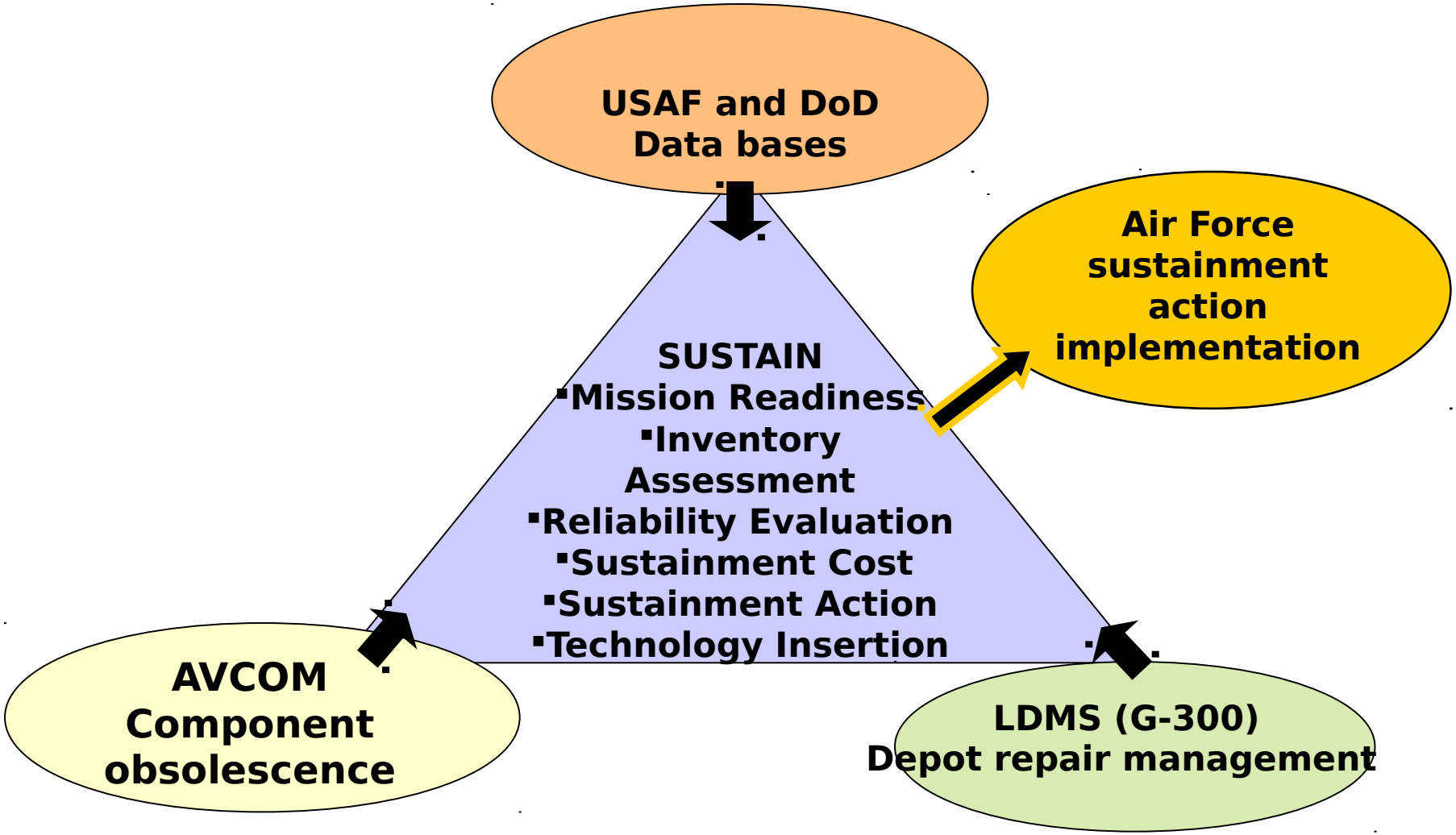
- **Where data is lacking, establish new capabilities**

WR-ALC/LFEA INITIATIVES

  - **AVCOM – DMS management**
  - **LDMS – Depot repair activity**

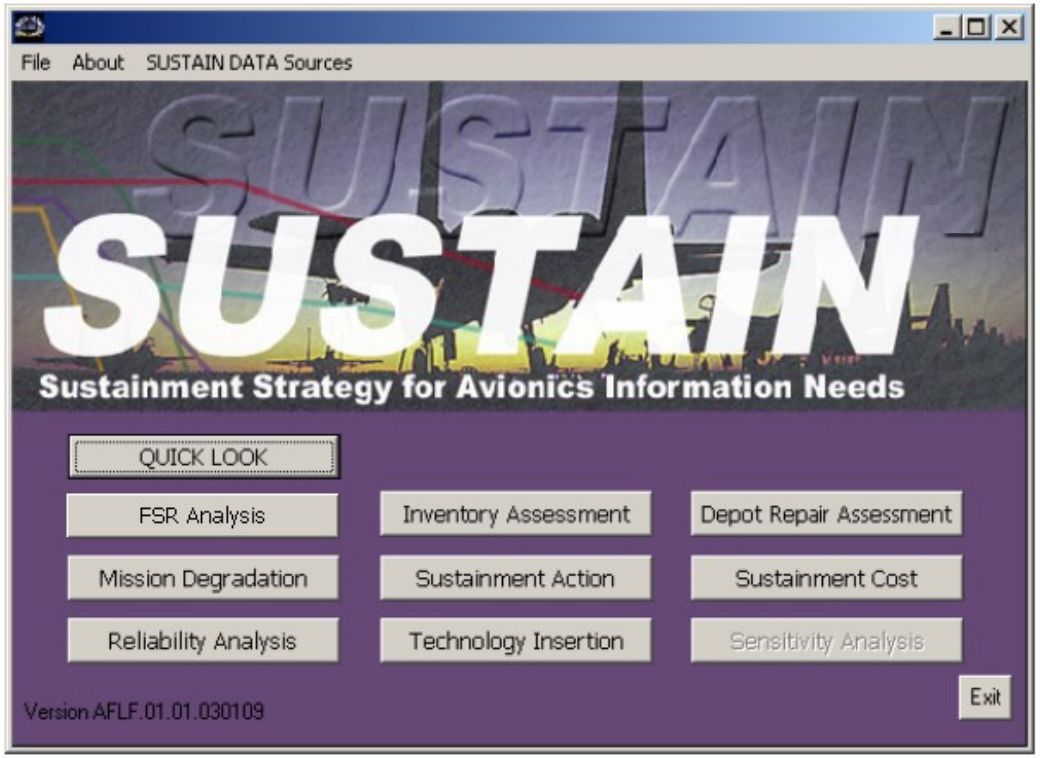
- **Data programs must provide benefits to all those involved in the collection and use of the information.**

F-15 Sustainment Approach



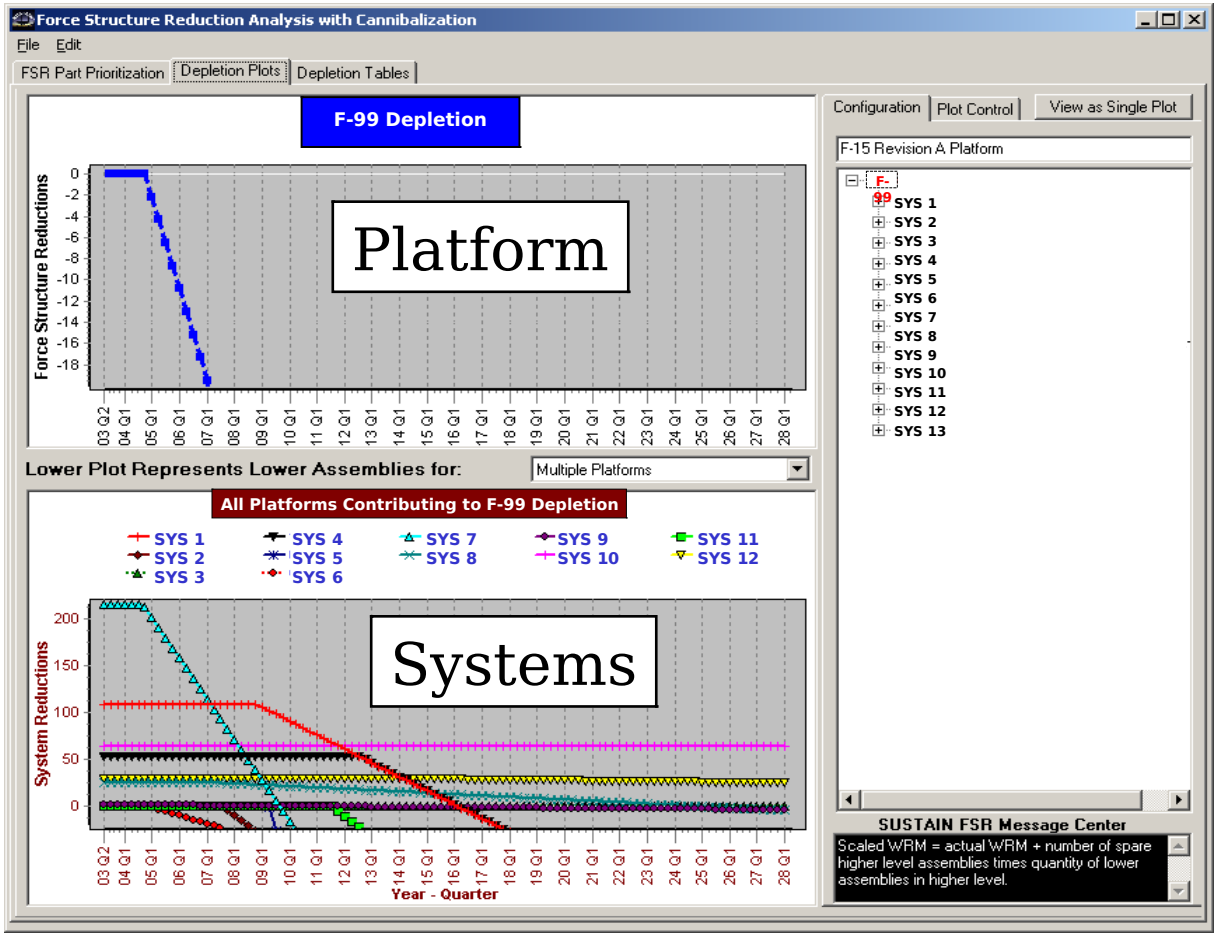
SUSTAIN

- **Automates most of the analysis and business case development for technology refreshment at the component and assembly levels**
- **Generates a prioritized list of component and board level projects**



Force Structure Reduction (FSR) Prediction

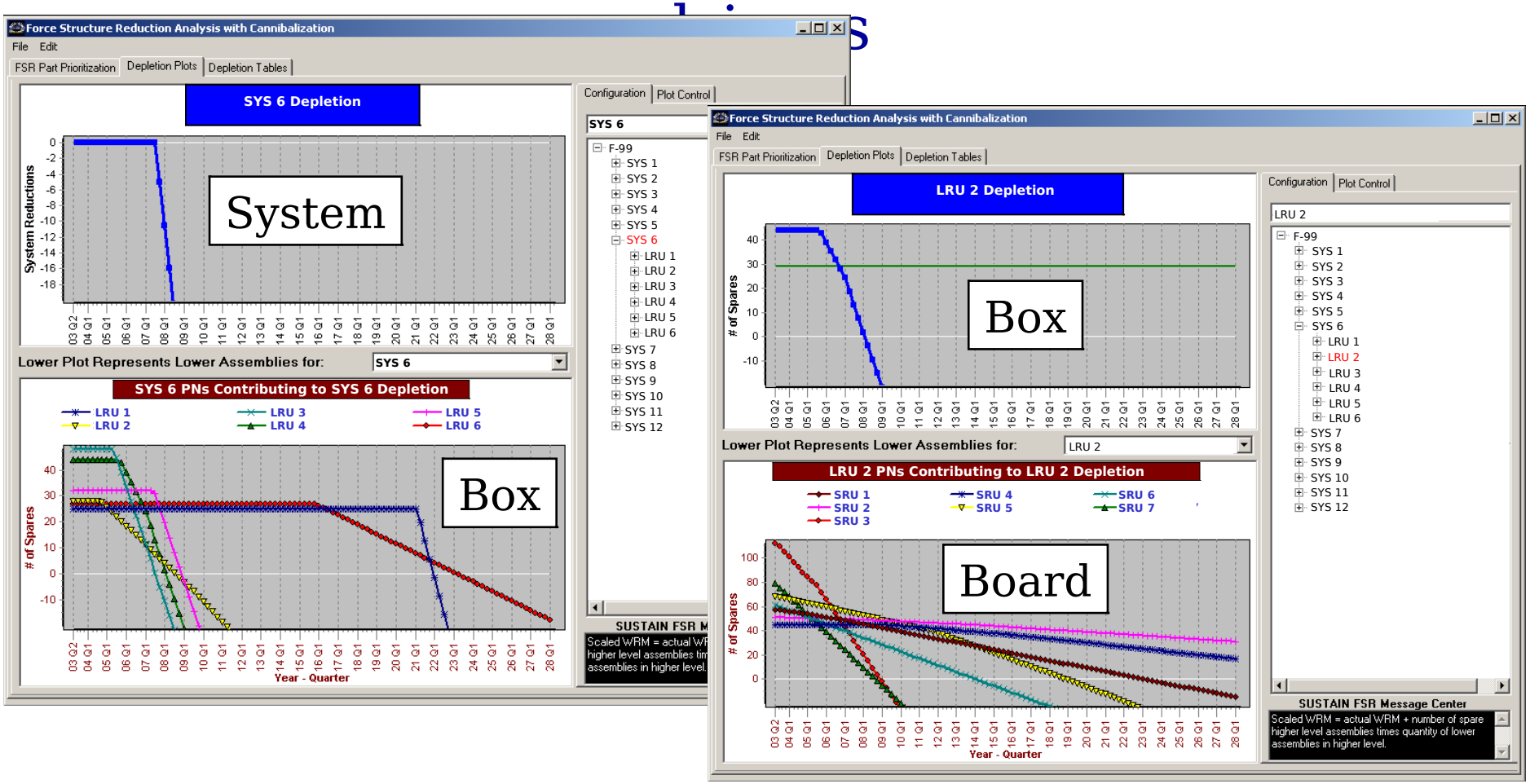
- Platform FSR drivers


Force Structure Reduction Analysis with Cannibalization
File Edit
FSR Part Prioritization
Depletion Plots
Depletion Tables
F-99 Depletion
Force Structure Reductions
Platform
Lower Plot Represents Lower Assemblies for:
Multiple Platforms
All Platforms Contributing to F-99 Depletion
SYS 1 SYS 2 SYS 3 SYS 4 SYS 5 SYS 6 SYS 7 SYS 8 SYS 9 SYS 10 SYS 11 SYS 12
System Reductions
Systems
Year - Quarter
Configuration
Plot Control
View as Single Plot
F-15 Revision A Platform
SYS 1 SYS 2 SYS 3 SYS 4 SYS 5 SYS 6 SYS 7 SYS 8 SYS 9 SYS 10 SYS 11 SYS 12 SYS 13
SUSTAIN FSR Message Center
Scaled WRM = actual WRM + number of spare higher level assemblies times quantity of lower assemblies in higher level.

- **A clear illustration of what is going to cause a problem, and when it must be dealt with**

FSR Prediction

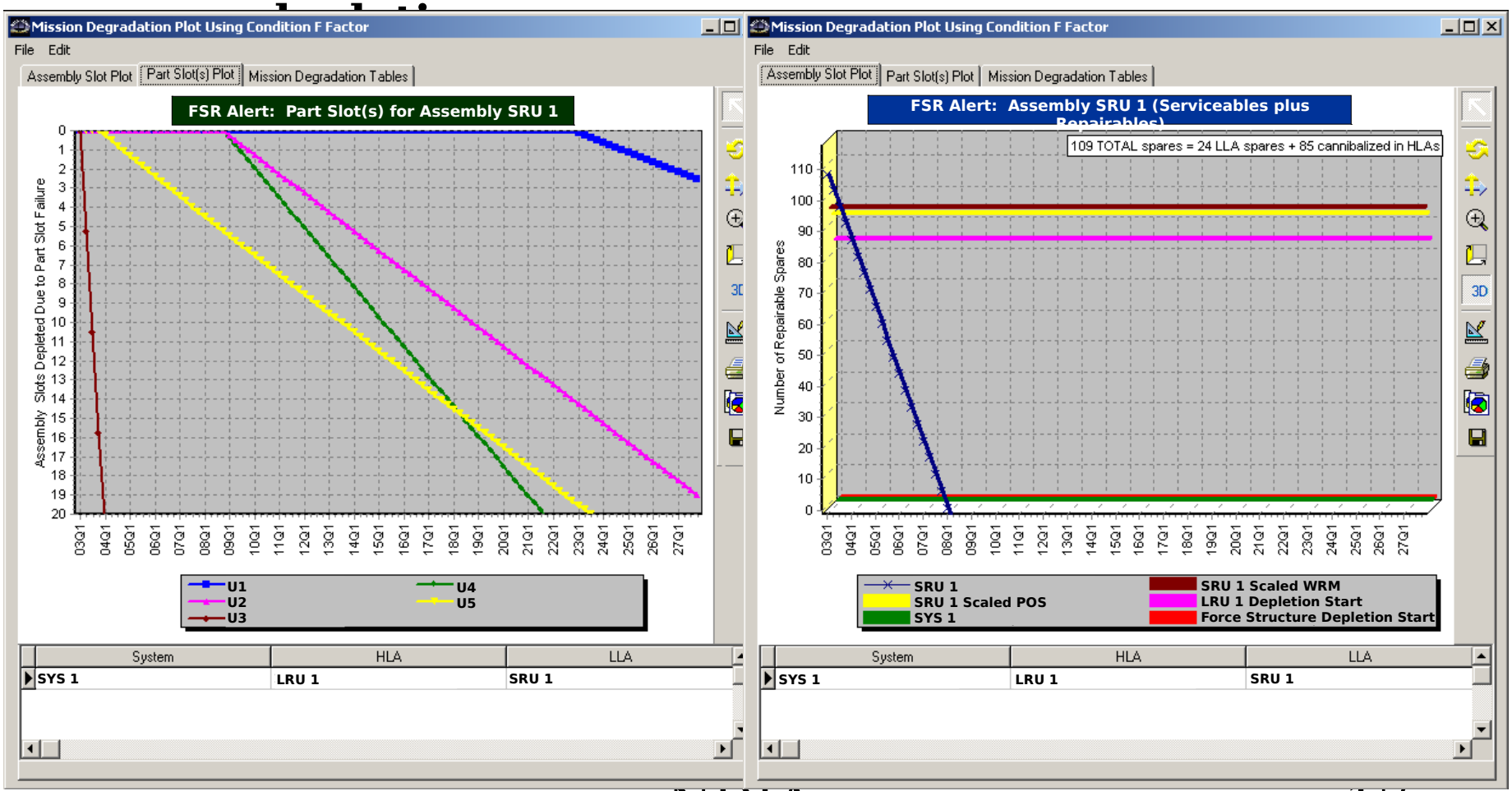
- Drilldown from system to board depletion



Mission Degradation

- **Identifies individual contributing components**

Components driving board [illegible] Resulting board depletion

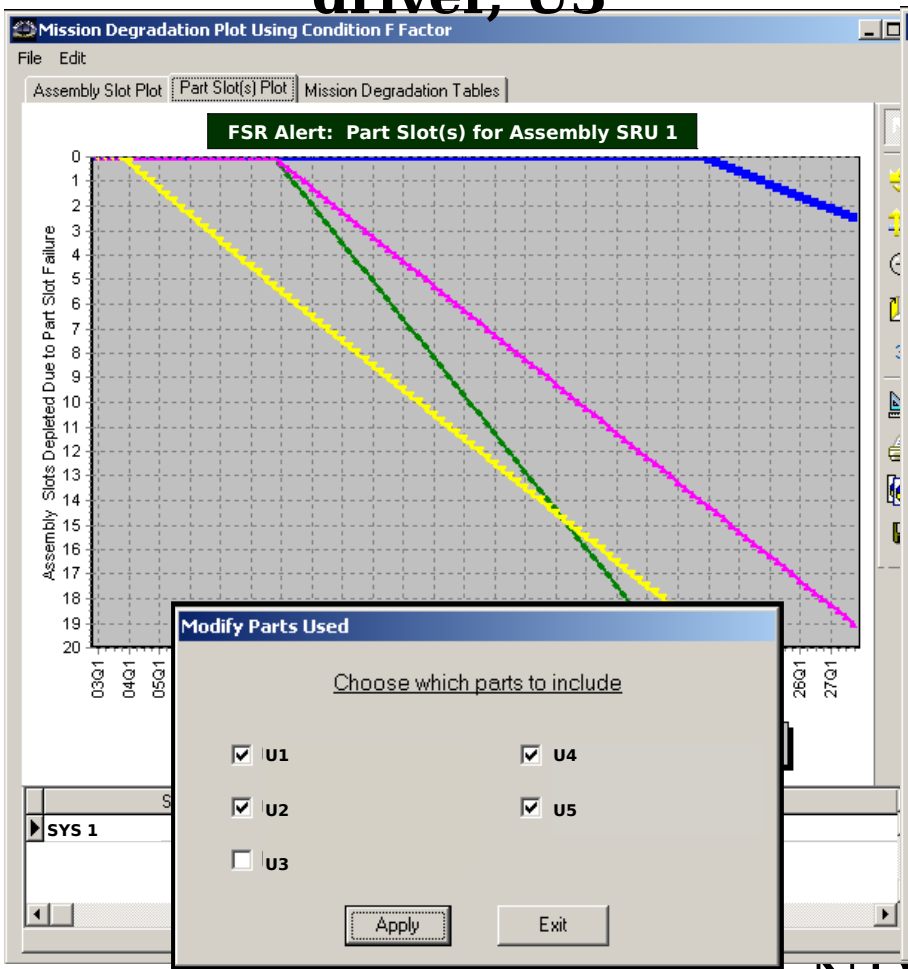


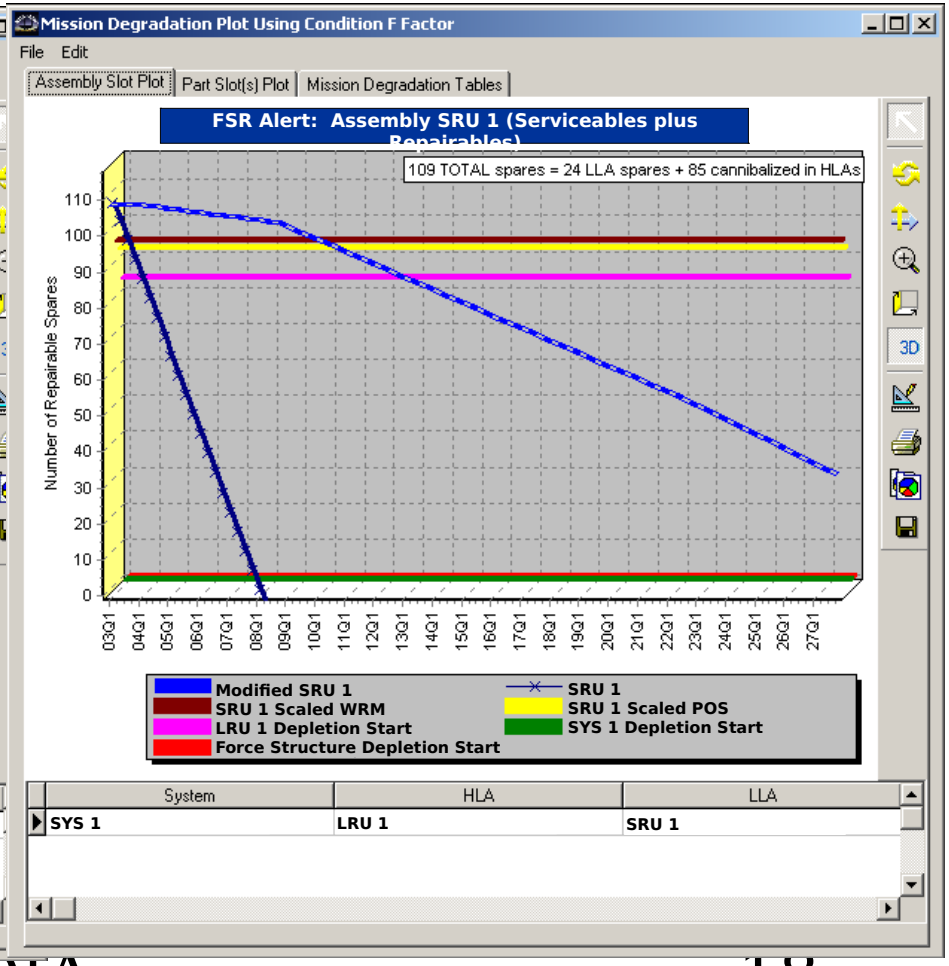
Mission Degradation

- **Sensitivity Analysis allows "what if" scenarios**

Resolve single component driver, U3

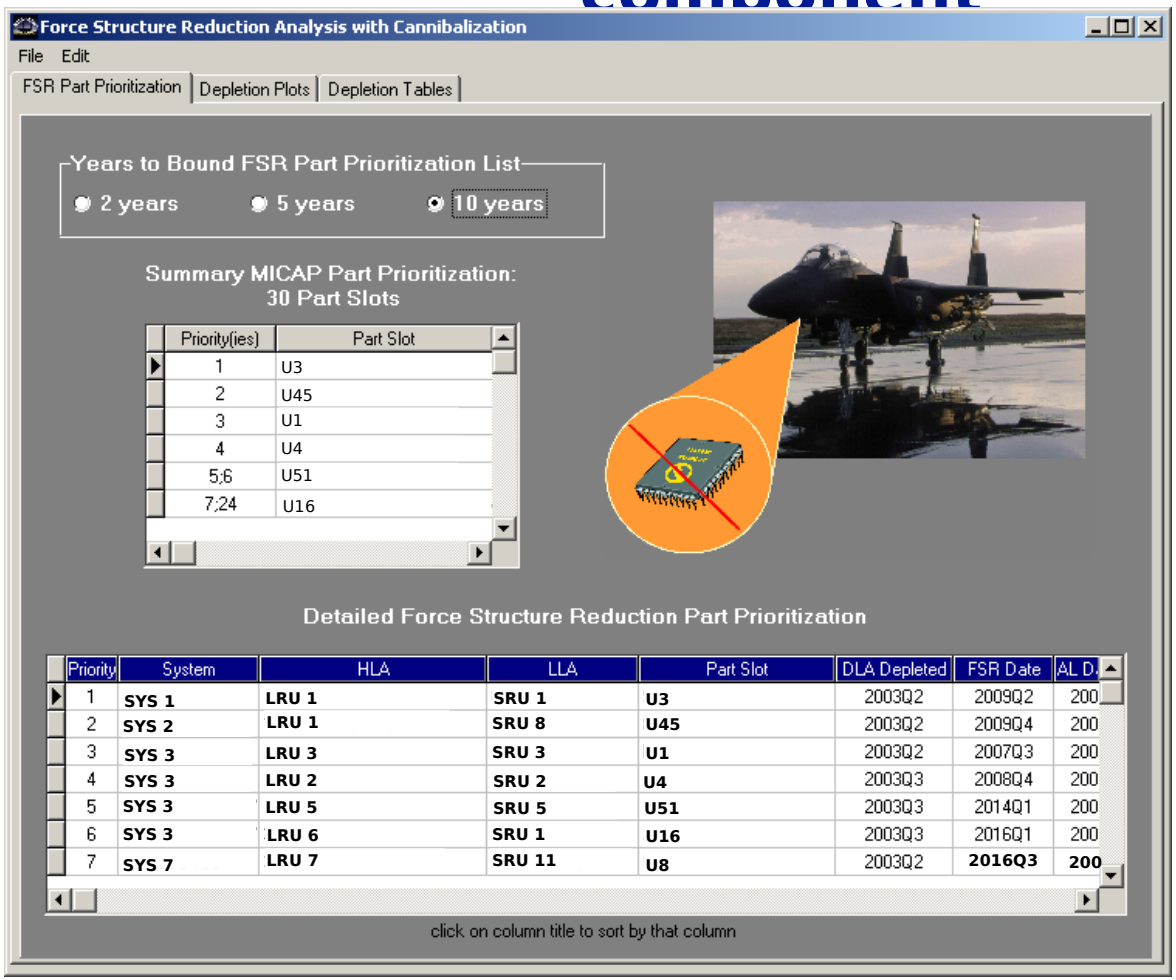
Resulting board depletion curve, "Modified board",





SUSTAIN FSR Analysis

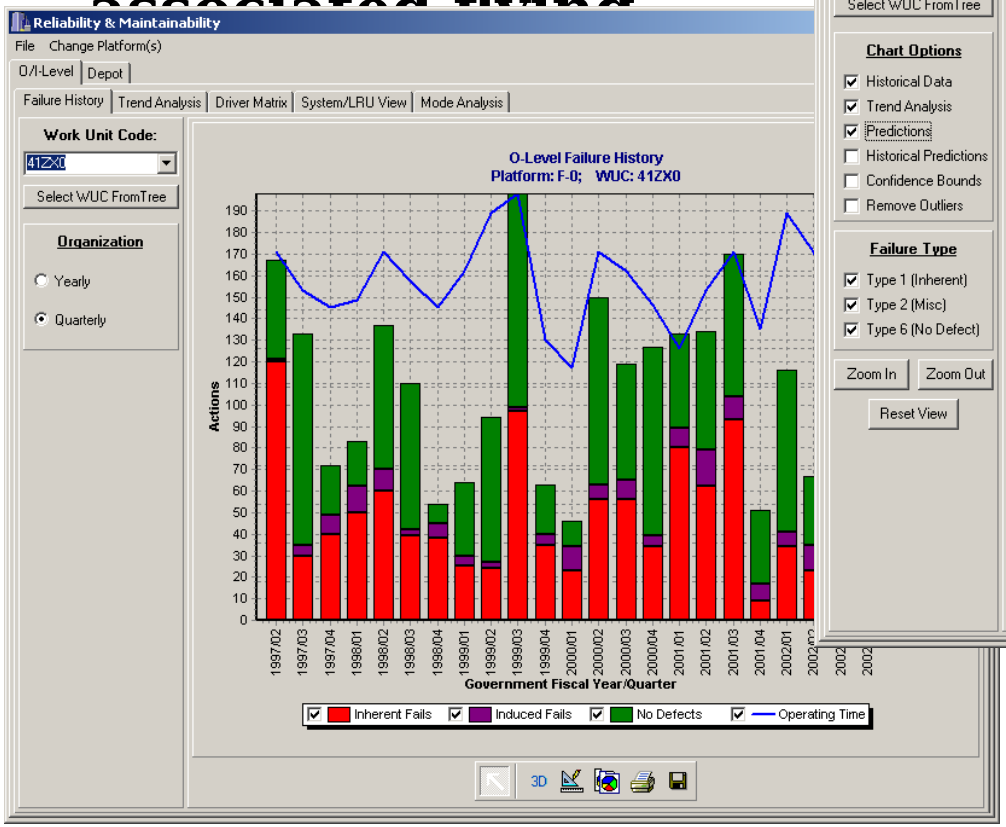
- **Platform FSR Avoidance Prioritization by component**

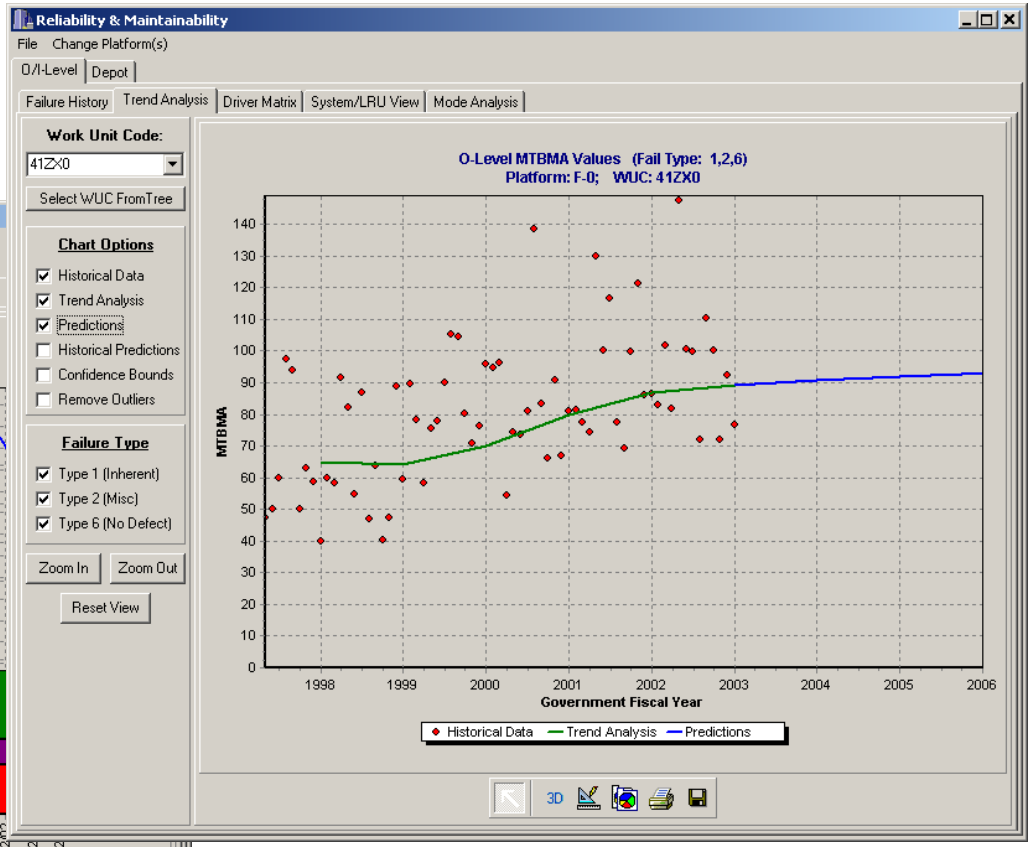

Force Structure Reduction Analysis with Cannibalization
File Edit
FSR Part Prioritization
Depletion Plots
Depletion Tables
Years to Bound FSR Part Prioritization List
2 years
5 years
10 years
Summary MICAP Part Prioritization:
30 Part Slots
Priority(ies)
Part Slot
1 U3
2 U45
3 U1
4 U4
5;6 U51
7;24 U16
Detailed Force Structure Reduction Part Prioritization
Priority System HLA LLA Part Slot DLA Depleted FSR Date AL D.
1 SYS 1 LRU 1 SRU 1 U3 2003Q2 2009Q2 200
2 SYS 2 LRU 1 SRU 8 U45 2003Q2 2009Q4 200
3 SYS 3 LRU 3 SRU 3 U1 2003Q2 2007Q3 200
4 SYS 3 LRU 2 SRU 2 U4 2003Q3 2008Q4 200
5 SYS 3 LRU 5 SRU 5 U51 2003Q3 2014Q1 200
6 SYS 3 LRU 6 SRU 1 U16 2003Q3 2016Q1 200
7 SYS 7 LRU 7 SRU 11 U8 2003Q2 2016Q3 200
click on column title to sort by that column

- **Automating the component technology refreshment business case process**

Reliability Analysis

Historical failures, by type, and associated flying

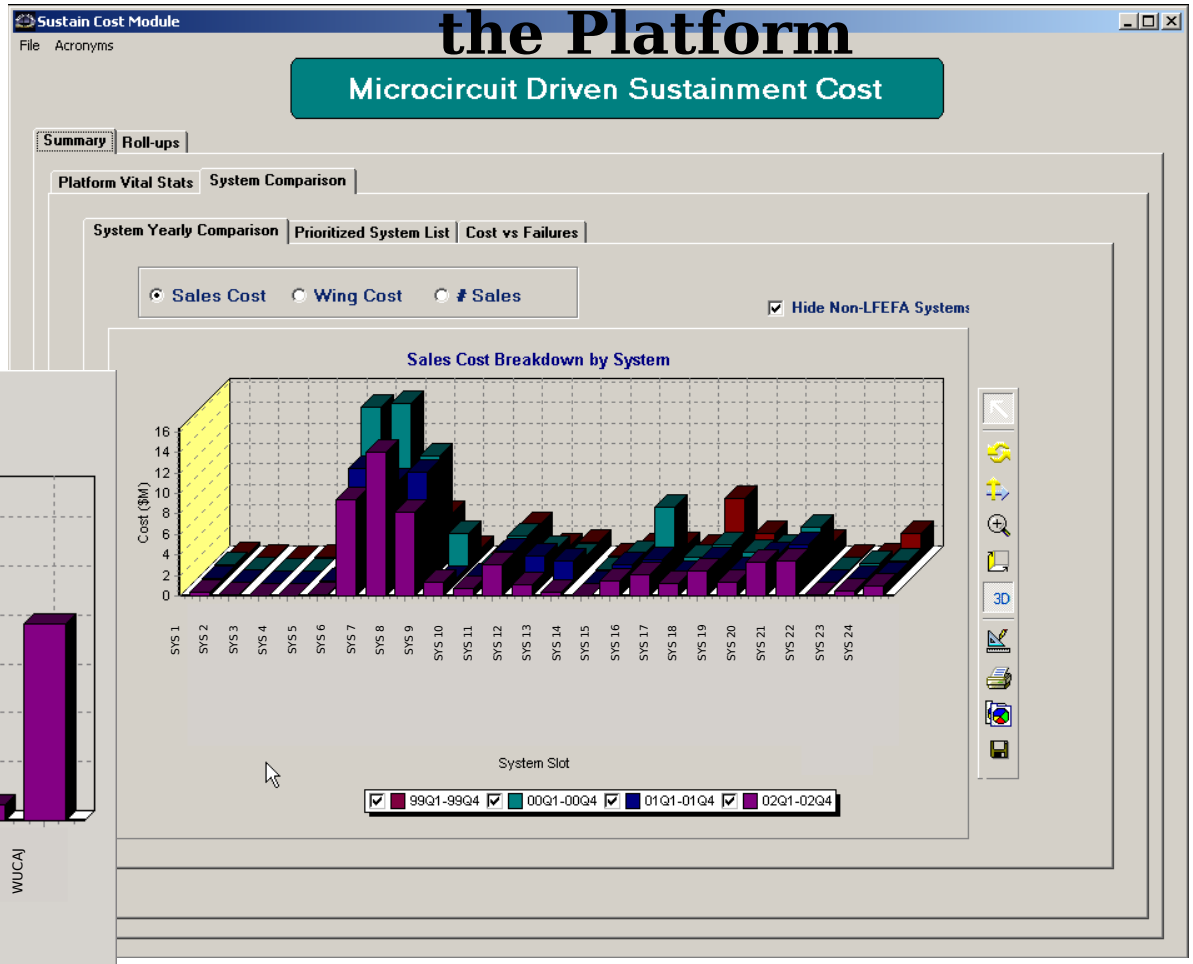




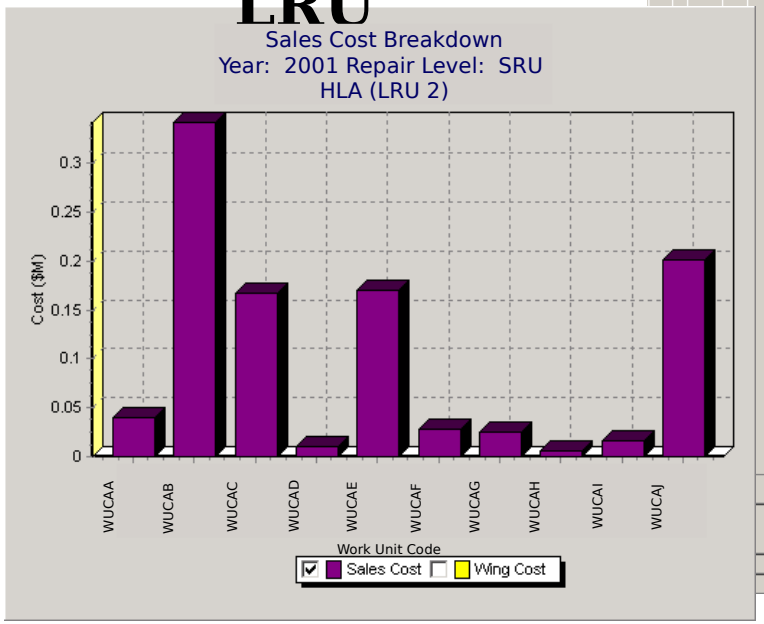
Trend analysis and prediction, based on past performance

Sustainment Cost

System sales cost comparison at the Platform



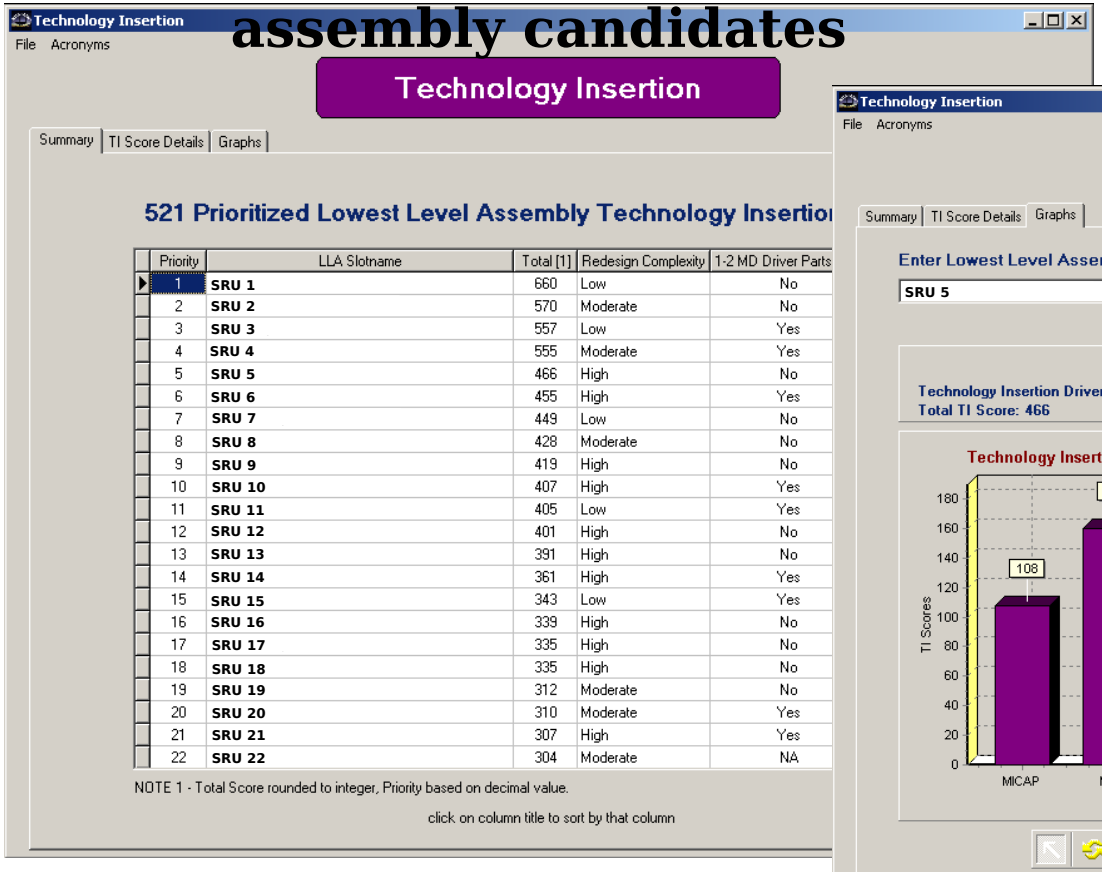
SRU sales cost per LRU



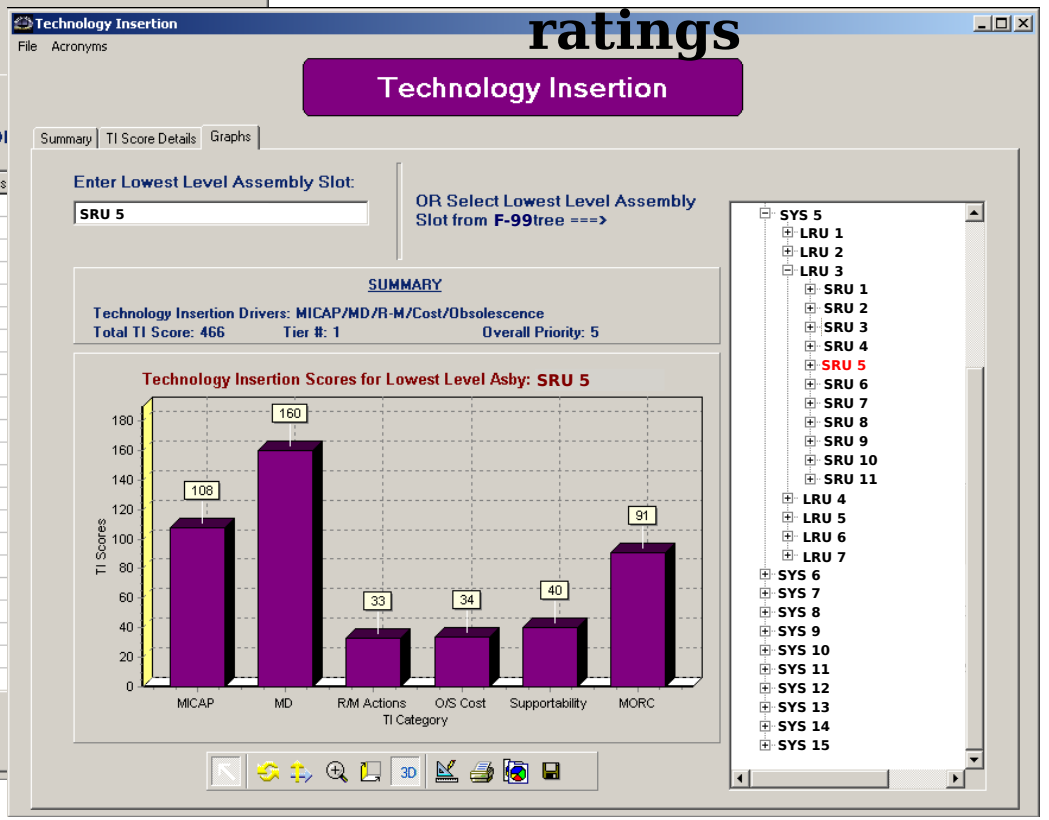
Technology Insertion

Prioritized ranking of technology refreshment assembly candidates

Individual assembly ratings

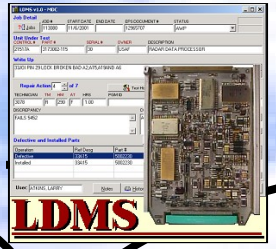

Technology Insertion
File Acronyms
Technology Insertion
Summary
TI Score Details
Graphs
521 Prioritized Lowest Level Assembly Technology Insertio
NOTE 1 - Total Score rounded to integer, Priority based on decimal value.
click on column title to sort by that column

Priority	LLA Slotname	Total [1]	Redesign Complexity	1-2 MD Driver Parts
1	SRU 1	660	Low	No
2	SRU 2	570	Moderate	No
3	SRU 3	557	Low	Yes
4	SRU 4	555	Moderate	Yes
5	SRU 5	466	High	No
6	SRU 6	455	High	Yes
7	SRU 7	449	Low	No
8	SRU 8	428	Moderate	No
9	SRU 9	419	High	No
10	SRU 10	407	High	Yes
11	SRU 11	405	Low	Yes
12	SRU 12	401	High	No
13	SRU 13	391	High	No
14	SRU 14	361	High	Yes
15	SRU 15	343	Low	Yes
16	SRU 16	339	High	No
17	SRU 17	335	High	No
18	SRU 18	335	High	No
19	SRU 19	312	Moderate	No
20	SRU 20	310	Moderate	Yes
21	SRU 21	307	High	Yes
22	SRU 22	304	Moderate	NA



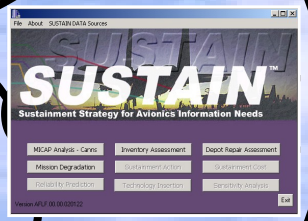
LFEA Partnerships

Raytheon

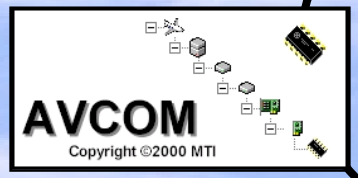


Boeing

GTRI



MTI



Depots

Sarnoff

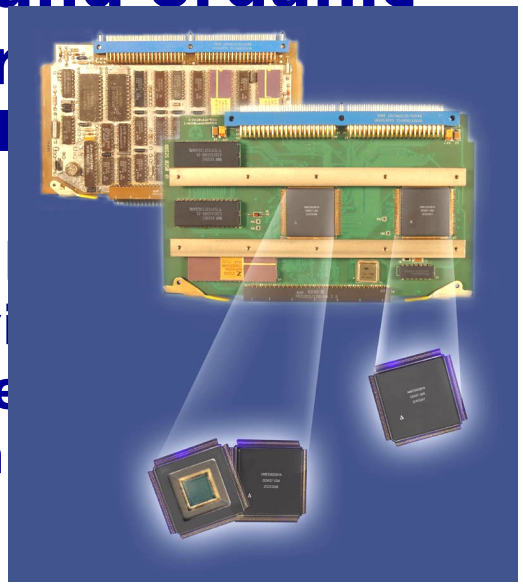
DLA

Generalized Emulation of Microcircuits (GEM)

- > 15 Government / Industry partnership – DLA/DSCC/Sarnoff
- Provides a continuing source of Form, Fit and Function replacement microcircuits, manufactured in Sarnoff's Class Q wafer foundry
- Eliminated/avoided 100 S redesigns using 229 uniq GEMed components throu 2002
- F-15 cost avoidance utiliz GEM devices > $50.1M

Advanced Microcircuit Emulation (AME)

- **Develops and Demonstrates Advanced Emulation capability (beyond GEM)**
- **Partnering with PM's, OEM's, and organic activities for long term suppor**
  - **Provide obsolescence supportabil analysis**
  - **Implement customer supplied VH**
  - **Provide reverse engineering servi**
  - **Design AME devices for new syste**
  - **Replace multiple microcircuits on board**



- **F-15 Example**
  - **Team of MTI and WRAFB redesigned PACS, CPU SRU using AME devices – permanently designing out obsolescence**

Summary

- **WR-ALC/LFEA has established a standardized approach for identifying, prioritizing, and building the business case for both component and assembly technology refreshment.**
- **Reliance on automated software tools has made the process extremely efficient, repeatable and robust.**
- **Teamwork between LFEA, other government organizations, and their industrial and university partners is the enabling factor in this successful program.**